

project **FLOW**

FISHERIES LEARNING ON THE WEB

FOOD WEB

Chain, Chain, Chain



WATER

Let it Flow

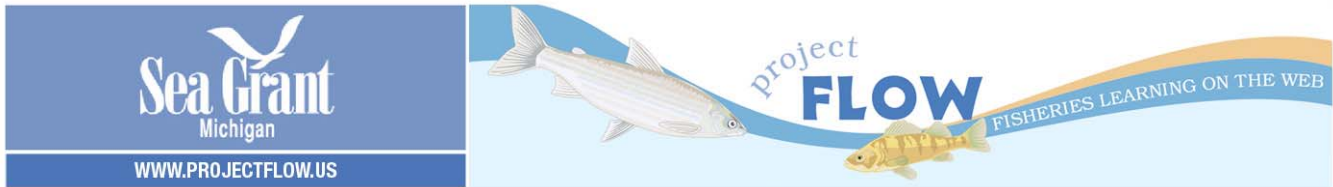


FISH

Today's Catch



WWW.PROJECTFLOW.US



About Project FLOW

Fisheries Learning on the Web or FLOW, is a collection of lessons and activities about the Great Lakes ecosystem, fisheries and stewardship and was developed by Michigan Sea Grant. It is part of Michigan Sea Grant's ongoing effort to provide K-12 teachers and informal educators with high-quality curriculum materials with hands-on, "plug-n-play" educational activities. Each lesson addresses state and national educational standards and benchmarks. For the most current lesson content, go to the Fisheries Learning on the Web or FLOW web site at www.projectflow.us.

Providing Meaningful Content

According to the National Science Education Standards, "students learn more science, and learn more about the nature of science, when they actively participate in finding out answers for themselves — using the process of inquiry." Each FLOW lesson includes a classroom or field activity to facilitate problem-based learning that is meaningful for today's youth. Through this effort, Michigan Sea Grant's primary goal is to facilitate learning through knowledge of the Great Lakes ecosystem. Additional goals include:

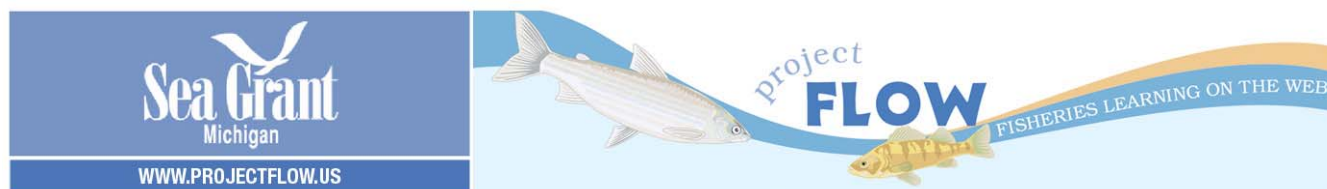
- Providing K-12 teachers with curriculum content that addresses current state and national standards and benchmarks;
- Increasing awareness of Great Lakes ecosystem concepts among 4th - 8th grade students in Michigan;
- Facilitating easy access for K-12 teachers to high-quality, low-cost Great Lakes education resources to help improve test scores; and
- Addressing the demand for educational materials that include engaging, high quality, colorful graphics to capture the imagination of students.

Filling the Gap

Educators have limited time and resources, with federally mandated testing requirements and in many cases, increased class sizes. As reinforced in the Great Lakes Fishery Trust's 2003 meeting, "Educators need... to obtain practical, cost-effective, accessible, and easy-to-use teaching tools." Key issues outlined in the 2001 *Great Lakes Fisheries Education Assessment and Summary of Needs* report, provided the FLOW development team with a basis for structuring curriculum material.

One of the tools for Michigan educators to determine the level of student knowledge is the Michigan Educational Assessment Program (MEAP) test. Fisheries Learning on the Web (FLOW) materials are designed to help educators by:

- Ensuring that all lesson content clearly address standards and benchmarks.
- Including engaging activities designed for classroom or field experiences.
- Standardizing key elements in each lesson: background, activity, and assessment.



- Providing meaningful assessment tools that include learning objectives, student performance and recommended points.
- Partnering with state-supported educational efforts, such as the Michigan Department of Environmental Quality's Michigan Education Curriculum Support (MEECS). FLOW is linked from two areas (Ecosystems and Water Quality) of the MEECS site, see MDEQ/MEECS, www.michigan.gov/deq
- Linking to additional educational resources and supplemental materials, about the Great Lakes and oceans. Additional educational activities, supported by Michigan Sea Grant and/or NOAA-National Sea Grant, include a variety of programs and curriculum materials. For more information, see Michigan Sea Grant Education www.miseagrant.umich.edu/education.

Credits

Project Support:

The Great Lakes Fishery Trust, <http://www.glft.org>. The Trust provides funding to enhance, protect and rehabilitate Great Lakes fishery resources.

Michigan Sea Grant College Program, <http://www.miseagrant.umich.edu>. Michigan Sea Grant is a cooperative program of the University of Michigan and Michigan State University. Michigan Sea Grant is supported by NOAA-National Sea Grant.

Project FLOW Development Team

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- Joyce Daniels, Instructional Editor
- Todd Marsee, Graphic Designer

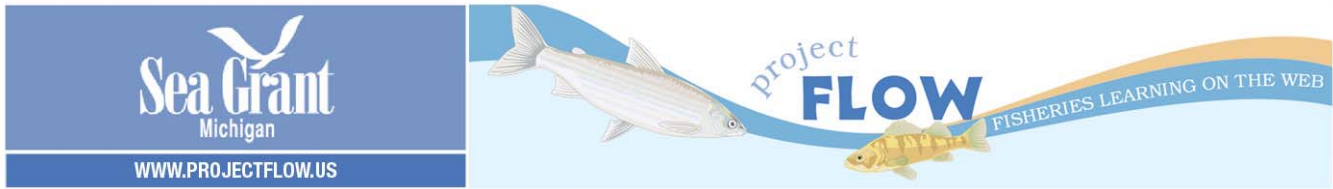
Project Consultants

- Phyllis Dermer (NOAA)
- Howard Perlman (USGS)
- Steve Stewart and Brandon Schroeder (Michigan Sea Grant)
- Gerald Smith (University of Michigan)
- K-12 Teachers: Dave Huntington, Mara Matteson and J. Katt

Feedback

Thank you to the many educators who provide ongoing feedback to help the development team keep improving the lesson content and activities. If you would like to complete a FLOW evaluation form, see the downloads section of each unit and send it to: Michigan Sea Grant, 440 Church St., Suite 4044, Ann Arbor, MI, 48109-1041.

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Assessment Overview

Assessments are provided for each lesson and include the following components:

- *Learning Objective*. Example: describe the difference between herbivores, carnivores, and producers.
- *Student Performance*. Example: Define herbivore, carnivore and producer.
- *Recommended Points*. Example: 1 point for each definition above (herbivore, carnivore and producer).

The assessment components above are based on Bloom's Taxonomy, named after Benjamin Bloom, an educational psychologist. Bloom identified the following levels of learning or cognition and provided specific verb examples that represent learning activity:

- Knowledge: arrange, define, label, memorize, order, recognize, restate, and repeat.
- Comprehension: classify, discuss, express, identify, locate, review, and translate.
- Application: choose, demonstrate, illustrate, practice, sketch, solve, and write.
- Analysis: appraise, calculate, compare, contrast, differentiate, examine, question, and test.
- Synthesis: assemble, compose, create, develop, formulate, plan, propose, and write.
- Evaluation: appraise, argue, attach, choose, defend, predict, select, support, value.

Example of Assessment Rubric: Unit 1, Lesson 1

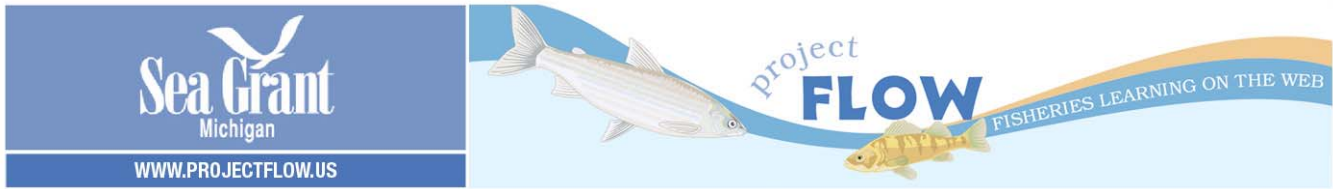
Example Assessment: Unit 1 Lesson 5 - Ruffe Musical Chairs

16 points total (Picking a subset of questions from those given with the lesson)

1. (3 points) Identify three things that every living thing needs to live.
2. (4 points) Explain 2 things that might happen if an animal does not get its needs met.
3. (3 points) Explain why an animal may not be able to meet its needs sometimes.
4. (3 points) List three characteristics of Eurasian Ruffe, which give them an advantage in meeting their needs as compared to native species.
5. (3 points) Explain how humans can decrease Eurasian Ruffe (and other non-native species) from spreading more.

Additional Ideas About Assessment

Teachers may wish to incorporate electronic journals (e-journals) into the lesson assessment process. E-journals can be as simple as using word processing software. They allow students to communicate about their understanding of lesson content, and provide



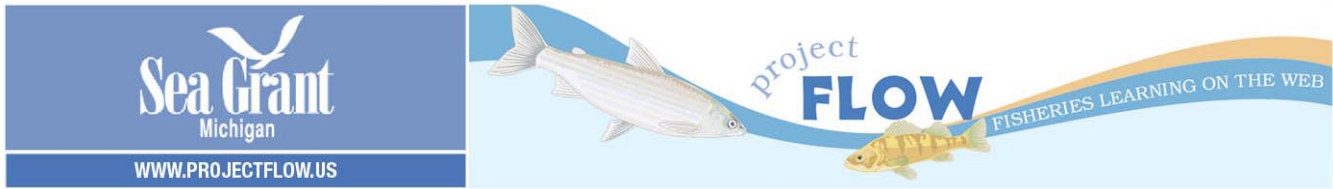
teachers with the capability of monitoring student development during the entire learning process.

Educators have found that the following resources for assessment are helpful in creating assessment tools (rubrics):

- Rubistar, online rubric development, <http://rubistar.4teachers.org>
- Kathy Schrock's Guide for Educators, <http://school.discovery.com/schrockguide/assess.html>

Assessment References:

- Bloom's Taxonomy adapted from: Bloom, B.S. (Ed.) (1956) Taxonomy of educational objectives: The classification of educational goals: Handbook I, cognitive domain. New York; Toronto: Longmans, Green.
- Kovalchick, Ann, Milman, Natalie, Elizabeth, M., Instructional Strategies for Integrating Technology: Electronic Journals and Technology Portfolios as Facilitators for Self Efficacy and Reflection in Preservice Teachers. In: "SITE 98: Society for Information Technology & Teacher Education International Conference (9th, Washington, DC, March 10 – 14, 1998). Proceedings."
- McGrath, Diane, (2003). Rubrics, Portfolios, and Tests, Oh My!: Assessing Understanding in Project-Based Learning. Learning & Leading with Technology, Volume 30 (Number 8).
- Wall, Janet E. (2003). Harnessing the Power of Technology: Testing and Assessment Applications. In Wall, Janet E. & Walz, Garry R. (Eds.), Measuring Up: Assessment Issues for Teachers, Counselors, and Administrators. (665 – 684). Greensboro: CAPS Press.



Standards

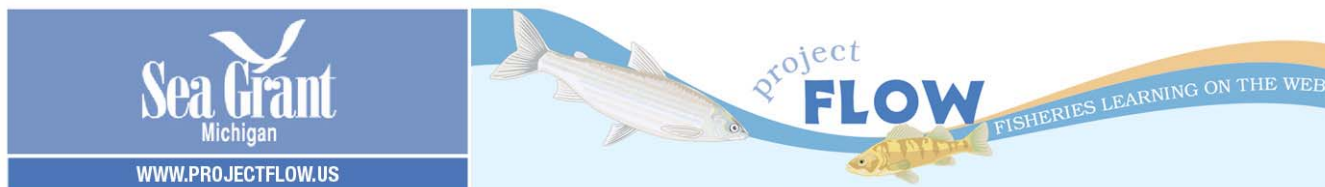
Relevant sections from educational publications were combed for applicable science and social studies content standards, benchmarks and guidelines for each Project FLOW lesson. Specific state and national standards/benchmarks that were explicitly covered by a certain lesson were documented for two age levels: elementary (4-6 grade) and middle (6-8 grade). Publications used include the following:

- Michigan Curriculum Framework, Michigan Department of Education
- National Science Education Standards
- National Academy of Sciences, 1996, National Academy Press, Washington, DC (ISBN 0-309-05326-9).
- Benchmarks for Science Literacy, Project 2061
- American Association for the Advancement of Science, 1993, Oxford University Press, Inc., New York, New York (ISBN 0-19-508986-3).
- North American Association of Environmental Education
- Expectations of Excellence, Curriculum Standards for Social Studies National Council for the Social Studies 2004, Bulletin 89, Silver Spring, Maryland (ISBN 0-87986-065-0).

Standards Lesson Tables

See: Standards charts and detailed summaries for each lesson.

If you have specific questions regarding the standards and benchmarks, please contact the Project FLOW development team. Email: msgpubs@umich.edu



Fisheries Learning on the Web (FLOW) Feedback

Please provide us with feedback about FLOW to help us improve the lessons.

First & Last Name:	Organization:		
Phone:	Email:		
Address:	City:	State:	Zip:

Please check your current profession and indicate grade level:

☐ Educator – grade Level: K-4 5-8 9-12 ☐ University Lecturer, Professor or Scientist

☐ Graduate Student ☐ Informal Educator (adults, children, or both adults & children):

Choose the lesson(s) that you used: ☐ Make the Connection ☐ Who's Eating Whom?

☐ Great Lakes Most Unwanted ☐ Beat the Barriers ☐ Ruffe Musical Chairs ☐ Exploring Watersheds

☐ Wetland in a Pan ☐ Water Quantity ☐ What Makes Water Healthy ☐ Hydropoly: A Decision-Making Game

☐ Fish of the Great Lakes ☐ Protecting Biodiversity ☐ Fish Habitat ☐ Great Lakes, Great Careers

Rating Scale: 1 - Very thorough, 2 - Sufficient, 3 - Somewhat lacking, 4 - Needs work

Lesson Objectives (circle one): 1 2 3 4

Lesson Background (circle one): 1 2 3 4

Materials (circle one): 1 2 3 4 Suggestions for additional items:

Procedures (circle one): 1 2 3 4 Suggestions for additional items:

Lesson Assessment (circle one): 1 2 3 4

Is the assessment useful for measuring the learning objectives of the lesson (circle one)? Yes No

Ease of organizing and assembling the materials, (circle one): 1 2 3 4

Glossary (circle one): 1 2 3 4 Are the definitions of the terms clear and useful (circle one)? Yes No

Suggestions for additional items:

Is the inclusion of the standards and benchmarks content valuable for you (circle one)? Yes No

Please rate the lesson(s) overall (circle one): 1 2 3 4

Is the material in the lesson(s) appropriate for your grade level (circle one): Yes No

If no, please specify:

Do you currently cover Great Lakes ecology in your classroom (circle one)? Yes No

Do you currently use Michigan Sea Grant activities or products (e.g., posters, fact sheets web site) in your classroom (circle one)? Yes No What product(s):

How did you find out about FLOW? (check all that apply)

☐ Michigan Sea Grant Web site ☐ Michigan Sea Grant Staff ☐ Upwellings newsletter

☐ Colleague ☐ Other, please specify:

Additional Comments or suggestions:

May we use your comments in our materials (circle one)? Yes No